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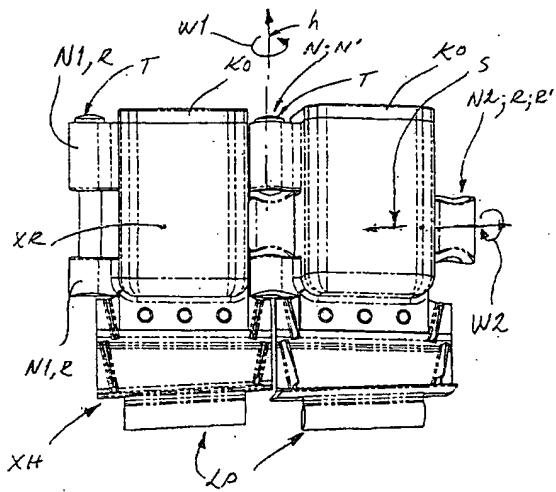
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Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: SCRAPER



(57) Abstract: The invention relates to a scraper, which comprises an elongated, at least tension transmitting flexible structure, which is formed of formed pieces (X), being coupled with each other one after the other in a longitudinal direction (s) and that are arranged to twist (w1) in respect with each other round an axis standing in a direction of height (h) by means of a joint arrangement (N), whereby the joint arrangement (N) comprises edge projections (N1), existing in a preceding formed piece one below the other in the direction of height (h) of the formed piece, and a central projection (N2) existing in the following formed piece and that is to be placed between the above edge projections. A joint arrangement (N; N') is arranged to enable twisting (w2) of the successive formed pieces (X) in respect with each other round an essentially longitudinal axis (s).

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## Scraper

The invention relates to a **scraper**, which comprises an elongated, at least tension transmitting flexible structure, which is formed of formed pieces, being coupled with each other one after the other in a longitudinal direction and that are arranged to twist in respect with each other round an axis standing in a direction of height by means of a joint arrangement, whereby the joint arrangement comprises edge projections, existing in a preceding formed piece one below the other in the direction of height of the formed piece, and a centre projection, existing in the following formed piece and that is to be placed between the above edge projections.

In Finnish patent No. 106947 there has been presented a **scraper bar apparatus**, which is meant to be used for scraping of substance in a liquid basin e.g. to a surface or a bottom chute by means of a **scraper bar arrangement** moving in the liquid basin. The **scraper bar apparatus** comprises thus an endless power transmission arrangement surrounding an area of the fluid basin to be treated, which is e.g. chain, wire rope or rope structured and arranged during an operational situation to circulate along the periphery of the treatment area by means of control and drive means. One or more **scraper bars** have been attached to the power transmission arrangement by their opposite ends, which, while rotating in the fluid basin, perform scraping of the fluid basin essentially all over the desired treatment area. This kind of a solution enables use of a flexible **scraper bar**, being attached by its opposite ends e.g. to a driving chain in a way that it is able to rotate continuously in the fluid basin inspite of the change distance between its opposite fastening ends, while simultaneously eliminating possible manufacturing/installation

inaccuracies of the fluid basin and/or the power transmission arrangement.

5 In said patent it is suggested to use a flexible structure as the scraper bar, such as a continuous wire rope, rope, hose, fabric, plastic, bar structure or some kind of a combination formed of the above. In the patent in question there has been suggested on the other hand use of a scraper bar, also, which consists of formed pieces, which are coupled with each other in a twisting manner by joints or correspondingly.

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15 In tests in practice it has been found that the type of first mentioned, so called rope-like scraper bar is not adequately "erect" as such in this type of applications, which is why its operating position does not stay as desired in prolonged use. On the other hand, when using fabric materials or other similar texture structures, a problem is caused due to 20 infavourable material getting collected to the same. On the other hand for the part of the scraper bar mentioned in the patent in question, there has been found also a need for development particularly due to the fact that a type of so called chain-structured 25 scraper bar, being suggested therein, is rather stiff, which is why the scraper bar tends to twist as a whole, when the scraper wipes e.g. over an exhaust chute. This is why the functioning of the type of scraper structure in question is not satisfactory, 30 because the scraper bar while getting twisted simultaneously rises upwards, whereby substance to be scraped may pass under the scraper.

35 It is an aim of the scraper according to the present invention to achieve a decisive improvement in the problems described above and thus to raise essentially the prior art in the field. In order to achieve this aim, the scraper according to the invention is

primarily characterized in that the joint arrangement, coupling the formed pieces, is arranged to enable twisting of the successive formed pieces in respect with each other round an essentially longitudinal axis.

By means of a scraper according to the invention it is possible to carry out with very simple structures an extremely reliably functioning scraper, which operates in a desired manner also in connection with floating structures. The optimum scraper movements of the scraper are made possible by enabling the successive formed pieces to twist in respect with each other when needed round an essentially longitudinal axis of rotation, which is why the scraper maintains a continuous contact e.g. to the counterpart surface of an exhaust chute and on the other hand also an optimum scraping position for the part of the contactless formed pieces. As an advantageous embodiment the scraper is furthermore arranged to be put together from parts e.g. in a way that a skirt part, which wears along with scraping, can be changed during maintenance measures. As an advantageous embodiment of the scraper according to the invention, there is arranged furthermore an auxiliary weight arrangement in its lower part when necessary in order to keep the scraper in a vertical position, when it goes freely on the surface of the fluid basin. Thanks to a stiffening/sealing arrangement, belonging as an advantageous embodiment to the scraper according to the invention, it is possible to affect functioning of the scraper both for the part of the scraping and so that substance to be scraped may not pass in an unwanted manner between the successive formed pieces or upwards along the same.

Advantageous embodiments of the scraper according to the invention have been presented in the dependent claims related to the same.

5 In the following description, the invention is being described in detail with reference to the attached drawings, whereby in

10 figure 1 is shown as a perspective view two advantageous formed pieces belonging to the scraper according to the invention, being coupled with each other,

15 figures 2a and 2b  
is shown successively coupled formed pieces, as shown in figure 1, as a side view and as a front view,

20 figures 3a, 3b, 3c  
is shown an advantageous frame of a formed piece belonging to the scraper according to the invention as perspective views seen from different directions,

25 figures 4a and 4b  
is shown the frame of the formed piece, shown in figures 3a - 3c, as a side view and as a front view,

30 figures 5a - 5c  
is shown an advantageous skirt part of a formed piece, belonging to a scraper according to the invention, as a side view, as a front view and as a view seen from below,

figure 6 is shown as a perspective view functioning of a scraper according to the invention, when it hits an exhaust chute,

5 figure 7 is shown the situation, shown in figure 6, as seen from the opposite direction, and

figure 8 is shown the situation according to figures 6 and 7 as seen from above.

10 The invention relates to a scraper, which comprises an elongated, at least tension transmitting flexible structure, which is formed of formed pieces X, being coupled with each other one after the other in a longitudinal direction s and that are arranged to twist w1 in respect with each other round an axis standing in a direction of height h by means of a joint arrangement N, whereby the joint arrangement N comprises edge projections N1, existing in a preceding formed piece one below the other in the direction of height h of the formed piece, and a centre projection N2, existing in the following formed piece and that is to be placed between the above edge projections. A joint arrangement N; N' is arranged to enable twisting w2 of the successive formed pieces X in respect with each other round an essentially longitudinal axis s, which principle may be seen particularly from figures 2a, 2b, 6, 7 and 8.

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35 The joint arrangement N comprises as an advantageous embodiment a hole R for a joint pin T or a like in said projections N1, N2, the hole existing essentially in the direction of height h. The upper and lower edges of the centre projection N2 are arranged, e.g. as shown in figures 1, 2a, 3a - 3c, arched and the hole therein R; R' to expand, when viewed in a cross section e.g. as shown in figure 4b, from the centre projection's N2 middle towards its upper and lower

edges, which makes possible swinging of the formed piece in respect with the joint pin T.

5 As an advantageous embodiment, each formed piece X of the scraper is mutually alike in a way that on its first joint surface there are edge projections N1 and on the other joint surface there exists the centre projection N2.

10 As an alternative solution with respect to the above there are two kinds of formed pieces in a way that on the opposite joint surfaces of the first ones of them there exists edge projections N1 and on the corresponding joint surfaces of the second ones of them there exists centre projections n2.

15 Furthermore as an advantageous embodiment with reference to figures 2a, 2b, 3a - 3c, 4a and 4b, in an essentially stiff-structured frame XR of the formed piece X there is arranged, preferably on quick-release principle, such as by a mortise and tenon joint, a removable attachable skirt part XH, as shown e.g. in figures 5a - 5c, which is manufactured from essentially softer/more flexible material than the frame XR of the formed piece. In this case the frame XR of the formed piece is manufactured profitably e.g. from polypropylene or like and correspondingly the skirt part XH from polyurethane, rubber or like.

20 30 As an advantageous embodiment the skirt part XH has fin-like or like stiffening/sealing arrangements XHL, XHL', projecting outwards r from its outer surface and which are arranged to enable twisting w1 of the successive formed pieces with respect to each other round a rotation axis existing essentially in the direction of height h.

As can be seen e.g. from figures 2a and 2b, a bottom fin XHL' belonging to the stiffening/sealing arrangement is arranged to rise in the direction of height h towards the other end of the formed piece X particularly to enable twisting of the successive formed pieces with respect to each other on so called 5 lap joint -principle.

Furthermore as an advantageous embodiment, the scraper 10 according to the invention is meant to be used particularly as a surface scraper in a fluid basin, such as a clarification basin or like. In this case the specific weight of the scraper is arranged essentially lighter than water by using e.g. as shown 15 in figures 3a - 3c a formed piece X with a hollow frame XR particularly in order to enable its use filled with air or flotation material.

Furthermore as an advantageous embodiment in the lower 20 part of the formed piece X, such as at the lower edge of the skirt part XH, there is arranged an auxiliary weight arrangement LP, such as a sleeve-like lower edge e.g. for a metal bar with a corresponding cross-section, particularly for keeping the formed piece in 25 an essentially vertical position, when it goes freely on the fluid surface.

It is clear that the invention is not limited to the 30 embodiments shown or described above, but it can be modified within the basic idea of the invention according to the needs and applications at any given time. Thus, a scraper according to the invention is particularly applicable also e.g. in so called oil containment boom -use or like, because with a scraper according to the invention it is possible, in addition 35 to restricting of oil that exists on the water, also to remove it thanks to the structure of the scraper that "lives" along with the surface of the water.

Furthermore it is naturally clear that a formed piece belonging to the scraper according to the invention may be put together e.g. so that all of its subcompositions are built-in. On the other hand it is 5 also possible to variate the shape and equipmentation of the formed pieces with respect to what has been presented before. In addition to the above, the formed piece belonging to the scraper according to the invention, as well as other subentireties belonging to 10 the same may be manufactured by utilizing the most differing manufacturing techniques from the most deviating materials.

## Claims:

1. Scraper, which comprises an elongated, at least tension transmitting flexible structure, which is formed of formed pieces (X), being coupled with each other one after the other in a longitudinal direction (s) and that are arranged to twist (w1) in respect with each other round an axis standing in a direction of height (h) by means of a joint arrangement (N), whereby the joint arrangement (N) comprises edge projections (N1), existing in a preceding formed piece one below the other in the direction of height (h) of the formed piece, and a centre projection (N2), existing in the following formed piece and that is to be placed between the above edge projections, **characterized** in that a joint arrangement (N;N') is arranged to enable twisting (w2) of the successive formed pieces (X) in respect with each other round an essentially longitudinal axis (s).
2. Scraper according to claim 1, the joint arrangement (N) of which comprises a hole (R) for a joint pin (T) or a like in said projections (N1, N2), the hole existing essentially in the direction of height (h), **characterized** in that the upper and lower edges of the centre projection (N2) are arranged arched and the hole therein (R; R') to expand, when viewed in a cross section, from the centre projection's (N2) middle towards its upper and lower edges.
3. Scraper according to claim 1 or 2, **characterized** in that each formed piece (X) of the scraper is mutually alike in a way that on its first joint surface there are edge projections (N1) and on the other joint surface there exists the centre projection (N2).

4. Scraper according to claim 1 or 2, characterized in that there are two kinds of formed pieces in a way that on the opposite joint surfaces of the first ones of them there exists edge projections (N1) and on the corresponding joint surfaces of the second ones of them there exists centre projections (n2).

5. Scraper according to any of the preceding 10 claims 1-4, characterized in that in an essentially stiff-structured frame (XR) of the formed piece (X) there is arranged, preferably on quick-release principle, a removeably attachable skirt part (XH), which is manufactured from essentially softer/more 15 flexible material than the frame (XR) of the formed piece.

6. Scraper according to any of the preceding 20 claims 1-5, characterized in that the frame (XR) of the formed piece is manufactured from polypropylene or like and a skirt part (XH) from polyurethane, rubber or like.

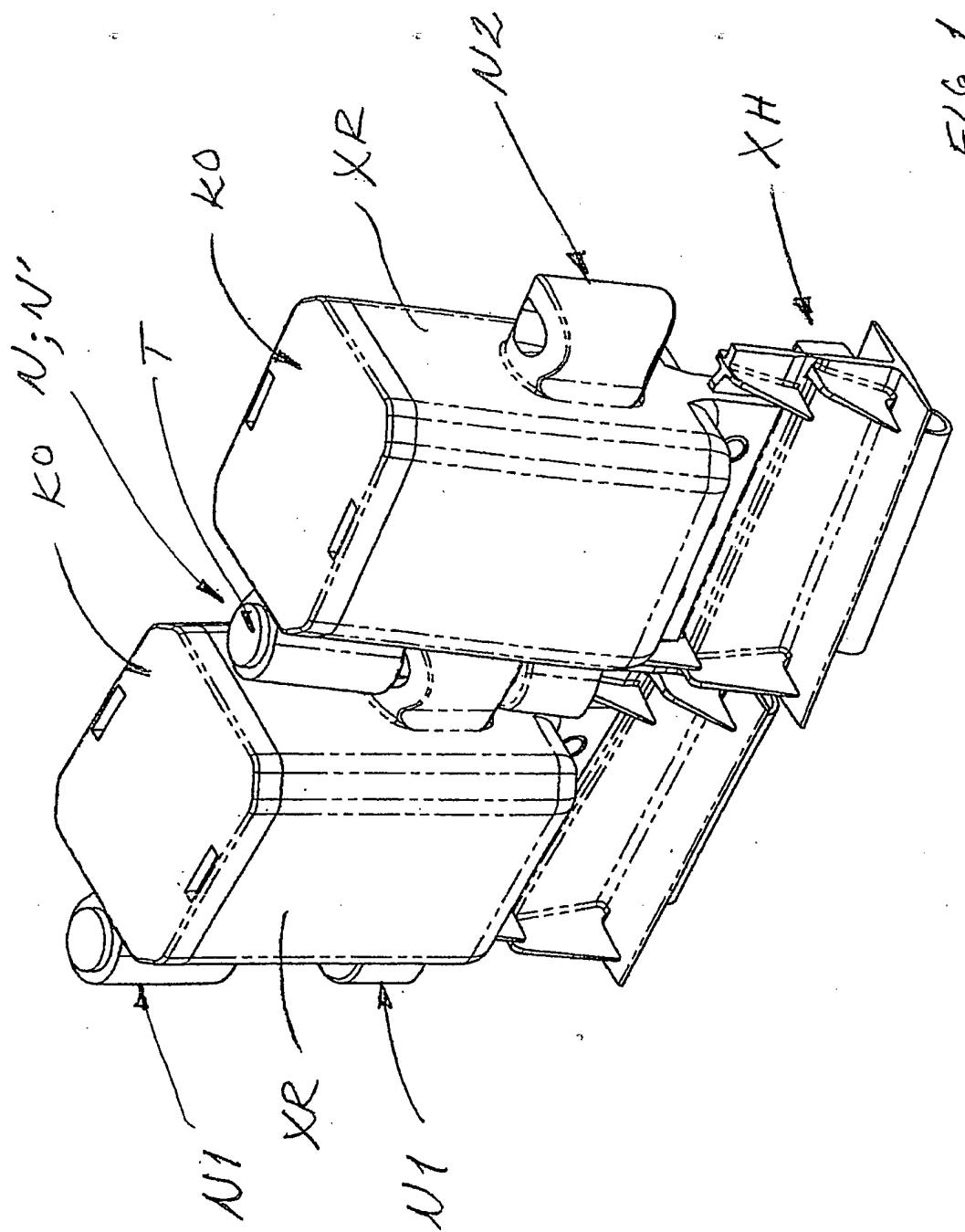
7. Scraper according to any of the preceding 25 claims 1-6, characterized in that the skirt part (XH) has fin-like or like stiffening/sealing arrangements (XHL, XHL'), projecting outwards (r) from its outer surface and which are arranged to enable twisting (w1) of the successive formed pieces with respect to each 30 other round a rotation axis existing essentially in the direction of height (h).

8. Scraper according to claim 7, characterized 35 in that a bottom fin (XHL') belonging to the stiffening/sealing arrangement is arranged to rise in the direction of height (h) towards the other end of the formed piece (X) particularly to enable twisting

of the successive formed pieces with respect to each other on so called lap joint -principle.

9. Scraper according to any of the preceding claims 1-8, which is meant to be used particularly as a surface scraper in a fluid basin, such as a clarification basin or like, **characterized** in that the specific weight of the scraper is arranged essentially lighter than water by using a formed piece (X) with a hollow frame (XR) particularly in order to enable its use filled with air or flotation material.

10. Scraper according to claim 9, **characterized** in that in the lower part of the formed piece (X), such as at the lower edge of the skirt part (XH), there is arranged an auxiliary weight arrangement (LP) particularly for keeping a floating formed piece in an essentially vertical position.



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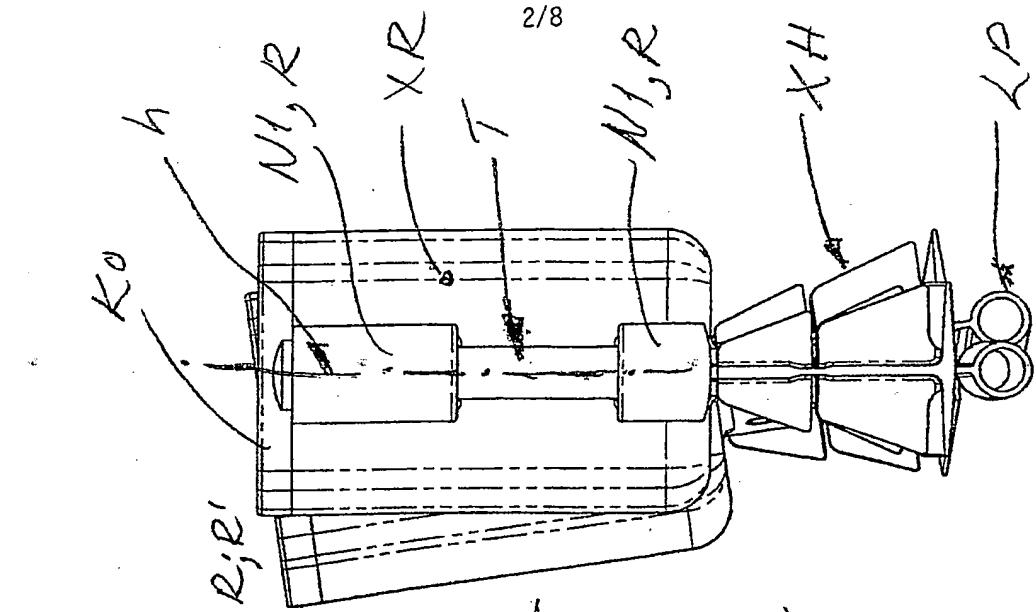


FIG. 2b

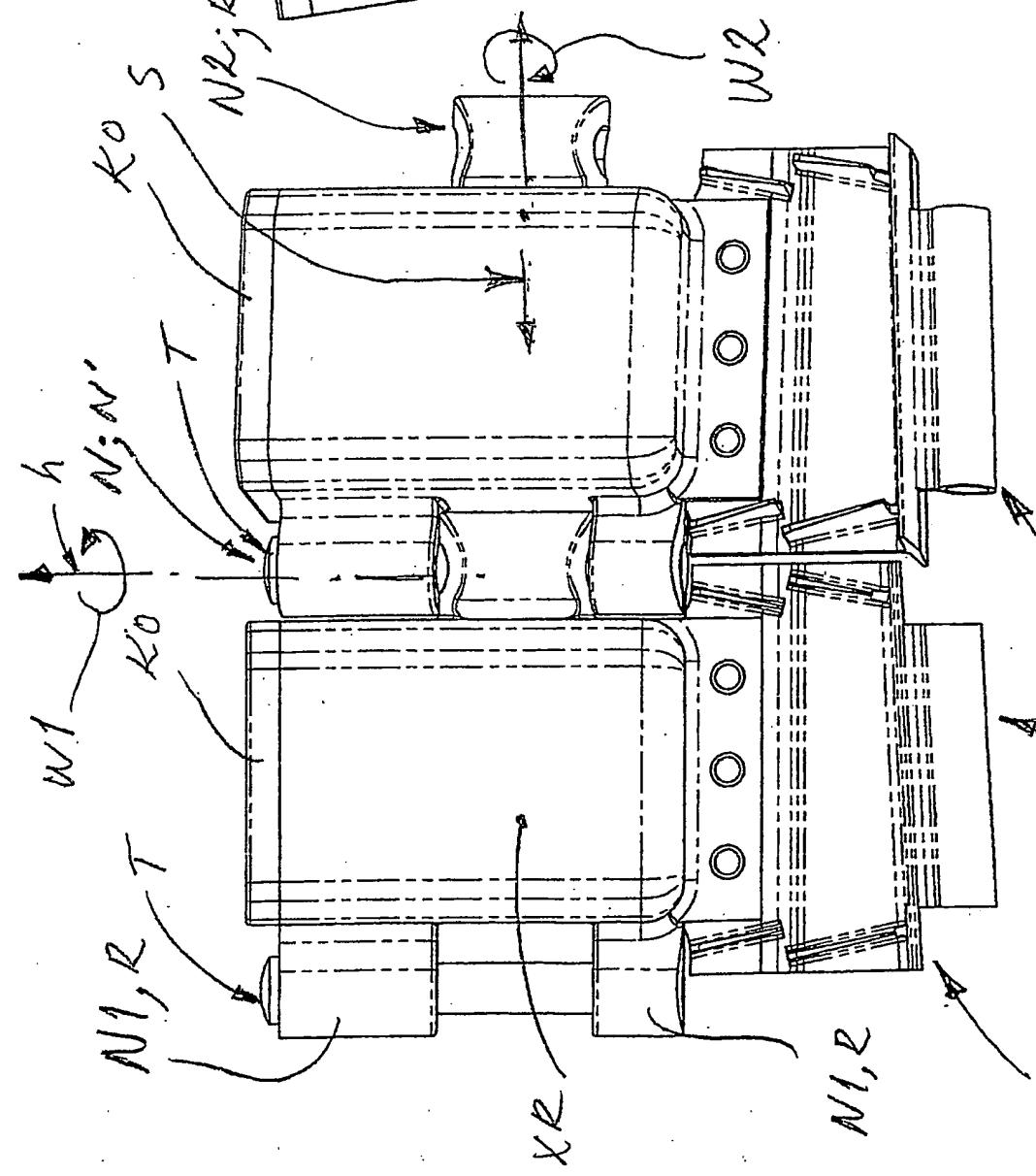


FIG. 2a

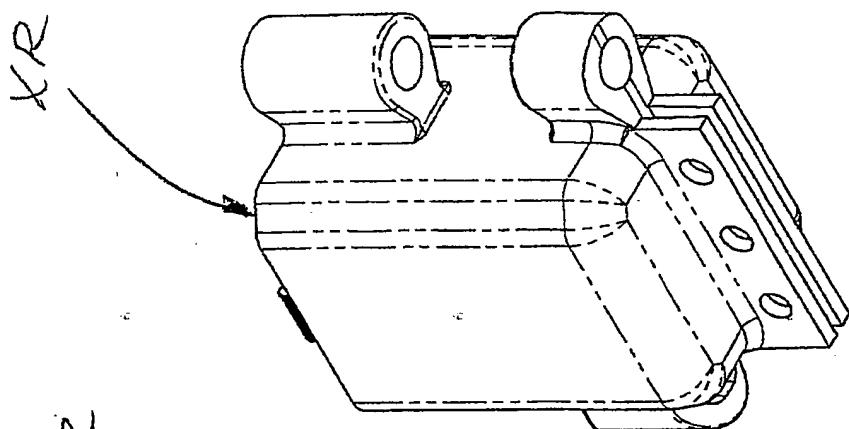
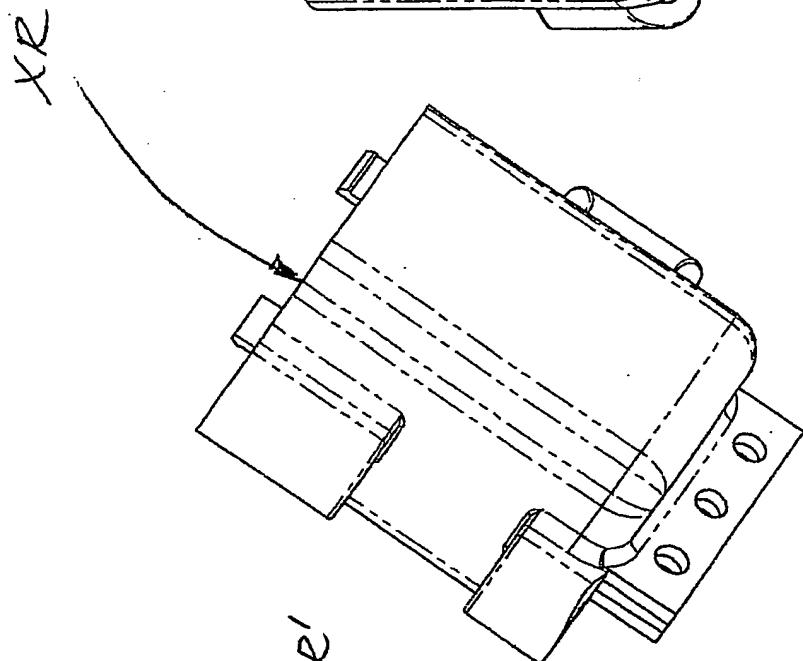
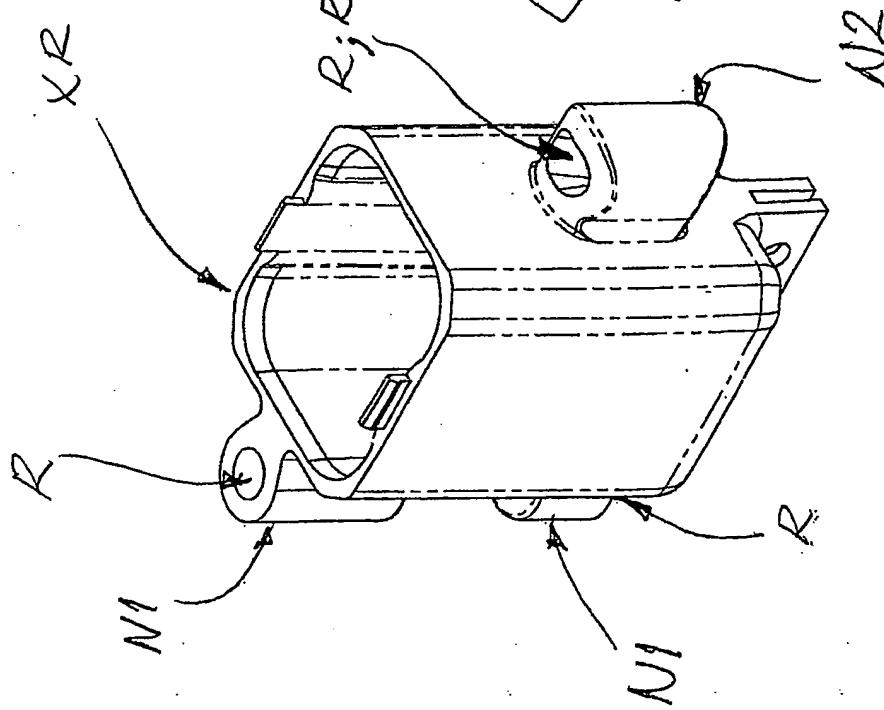


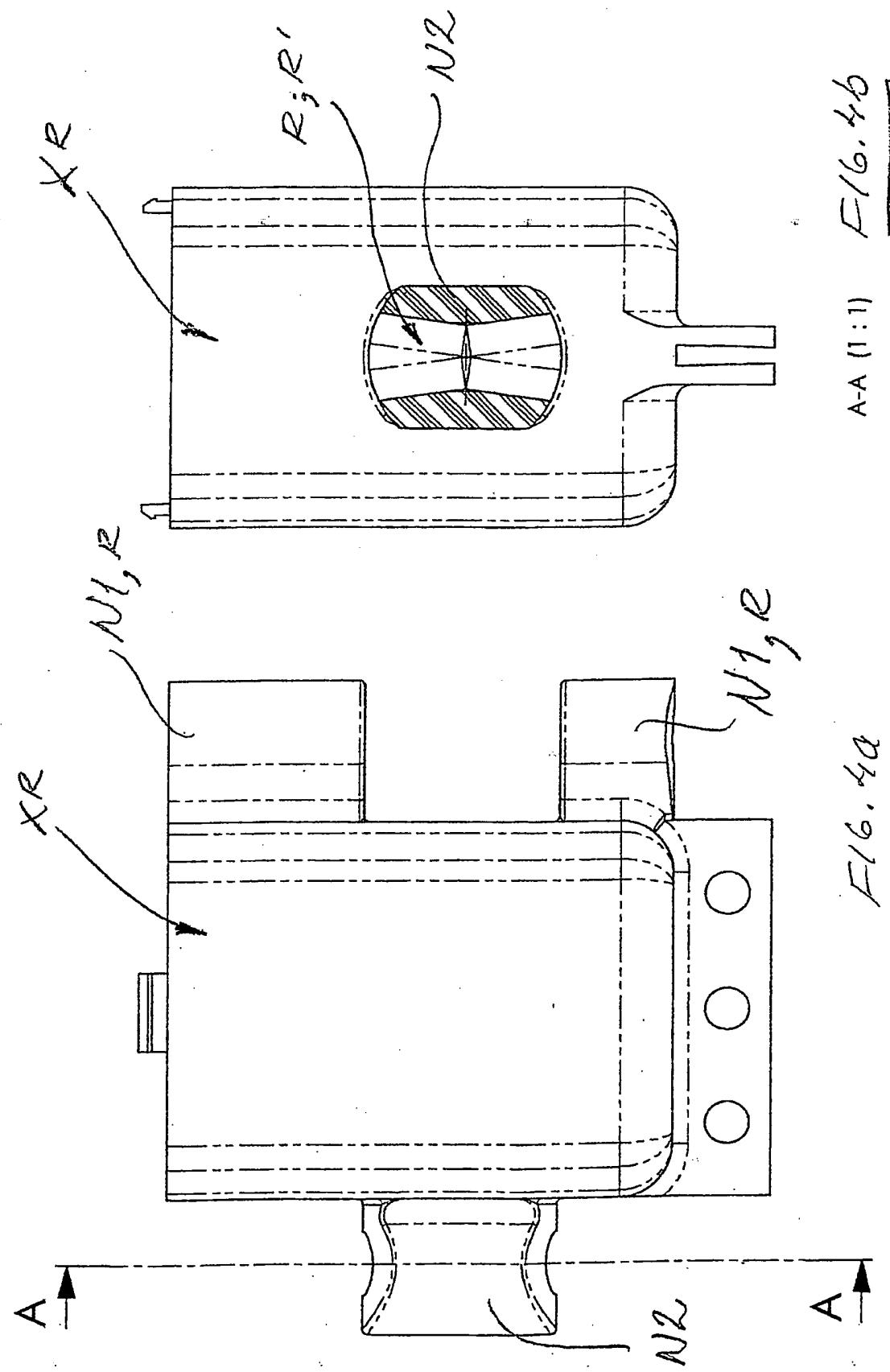
Fig. 3c



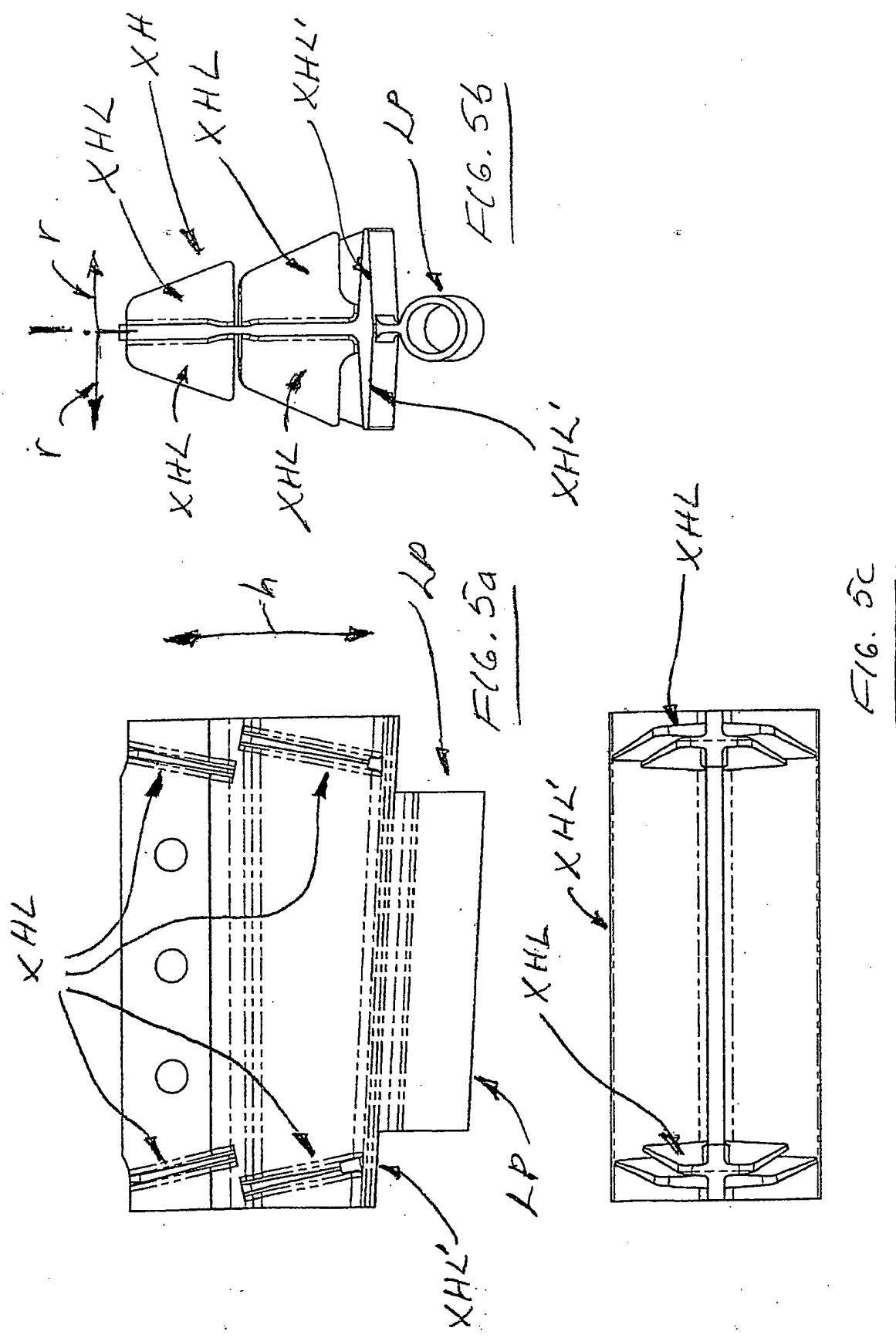
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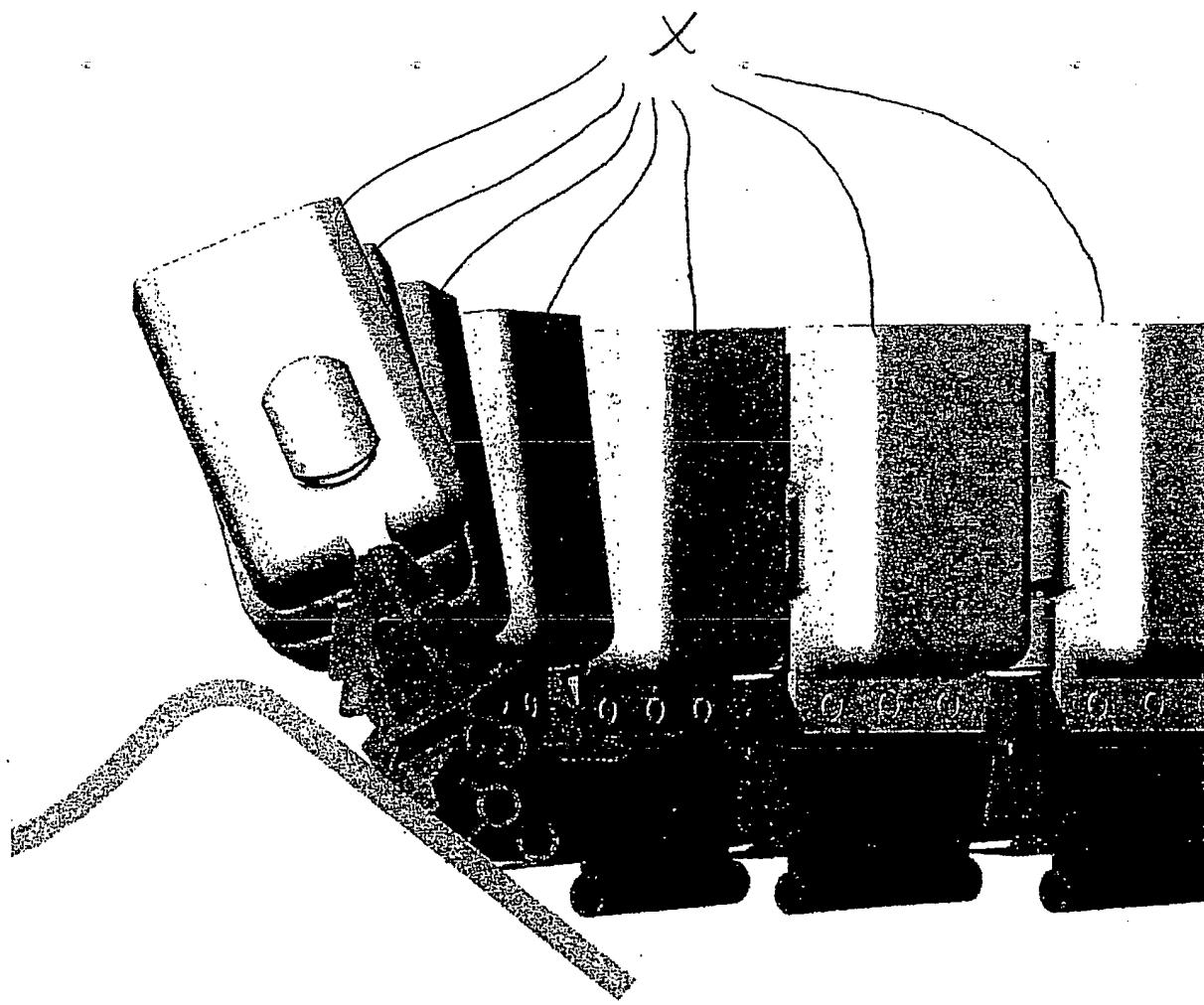


116. 3a



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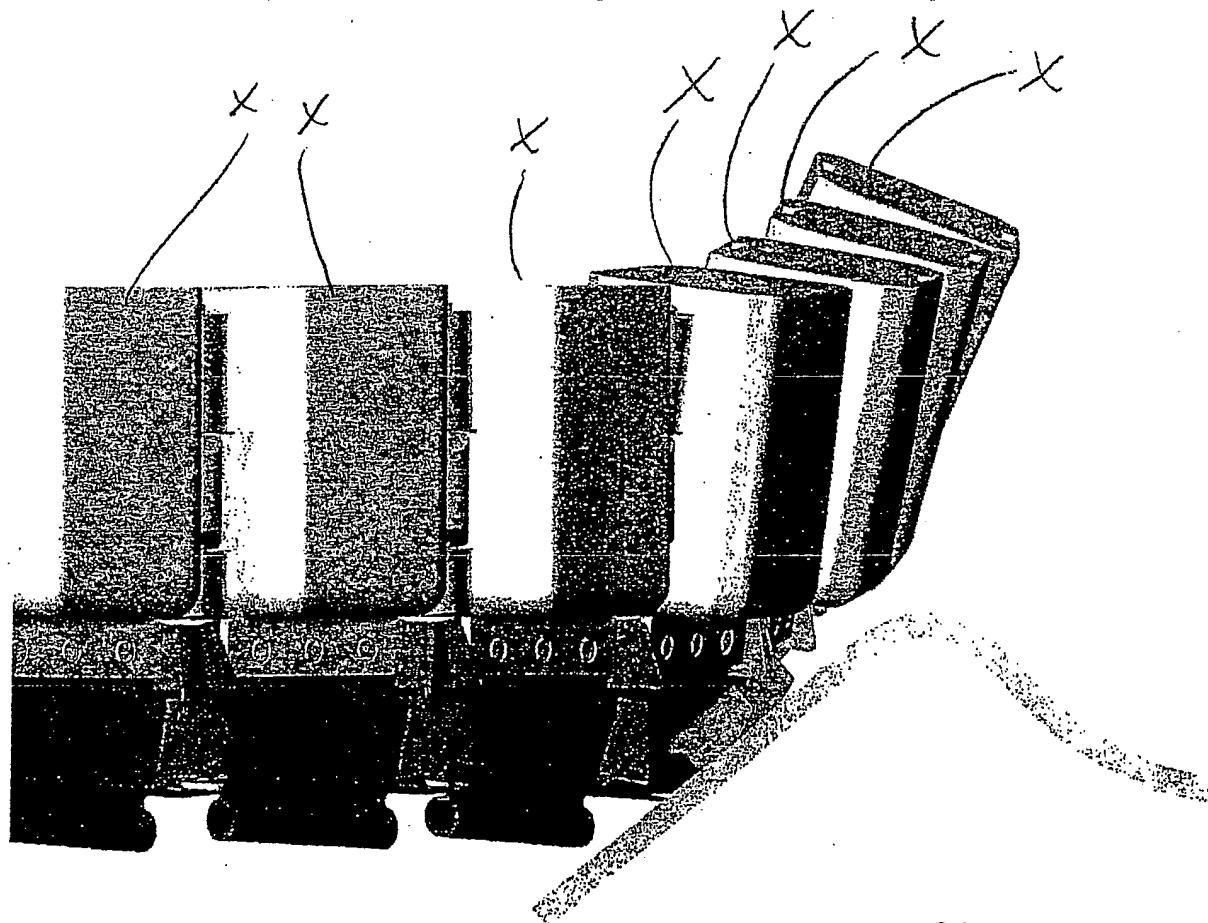




F16.6



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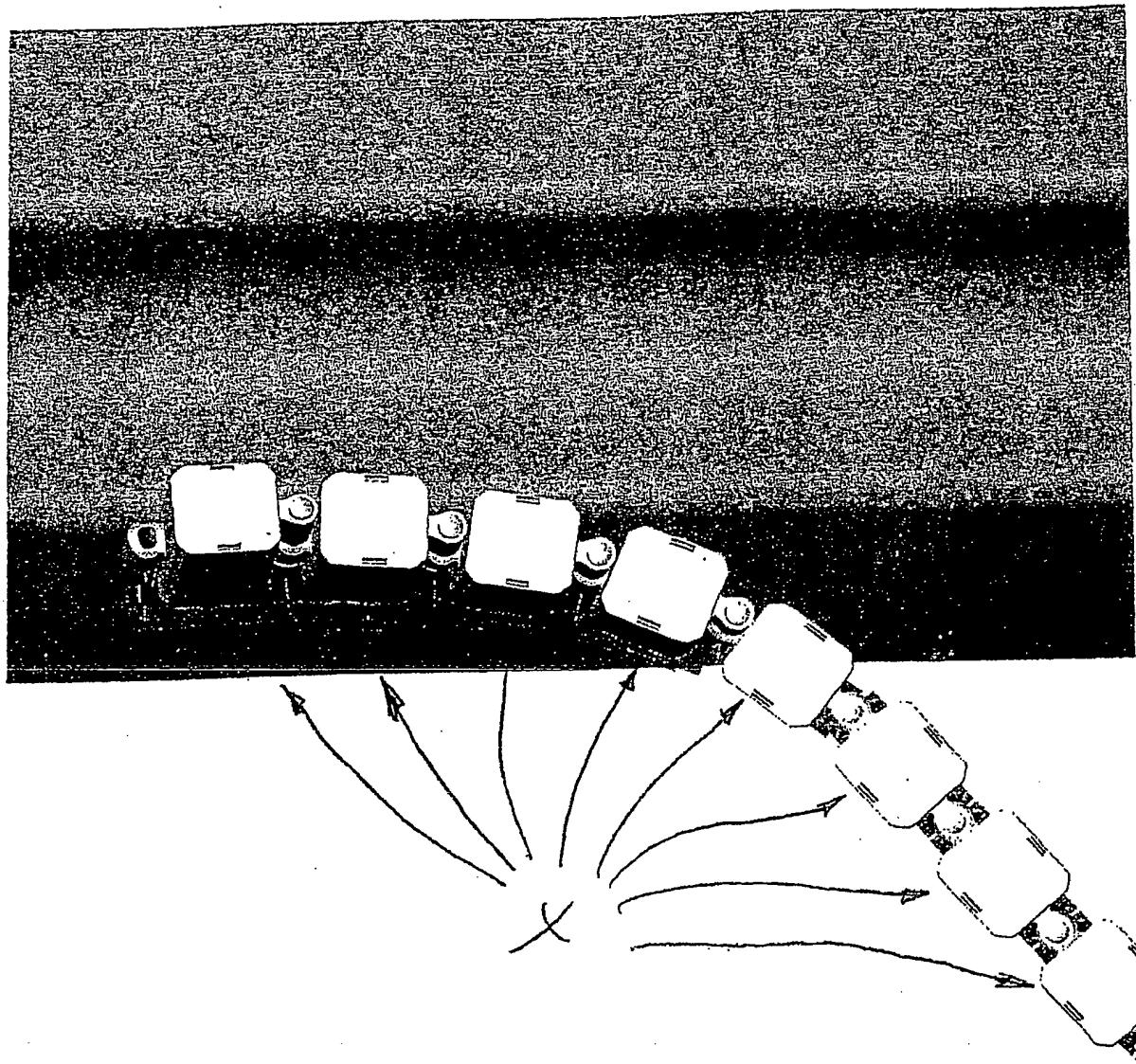


FIG. 8



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## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/FI 2005/000009

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B01D 21/18, B01D 21/06 // F16G 13/10, B65G 19/20  
According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B01D, F16G, B65G, E02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 1755680 A (N.D. LEVIN), 16 Sept 1930 (16.09.1930), whole document	1,5-8
Y	--	2-3
Y	WO 0228750 A1 (MORRIS, RANDALL, LEE), 11 April 2002 (11.04.2002), page 5, line 27 - page 7, line 9, figures 2-3,17	2-3
A	FI 100322 B (FINNketju INVEST OY), 14 November 1997 (14.11.1997), abstract	9-10
	--	

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:	
"A"	document defining the general state of the art which is not considered to be of particular relevance
"E"	earlier application or patent but published on or after the international filing date
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O"	document referring to an oral disclosure, use, exhibition or other means
"P"	document published prior to the international filing date but later than the priority date claimed
"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X"	document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y"	document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&"	document member of the same patent family

Date of the actual completion of the international search

20 May 2005

Date of mailing of the international search report

24-05-2005

Name and mailing address of the ISA/  
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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 2005/000009

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 0170603 A1 (FINNKETJU INVEST OY), 27 Sept 2001 (27.09.2001), whole document --	1
A	GB 378890 A (WILLIAM WARREN TRIGGS), 15 August 1932 (15.08.1932), whole document --	1
A	US 5031752 A (TEJA ROSTOWSKI ET AL), 16 July 1991 (16.07.1991), whole document -- -----	1

**INTERNATIONAL SEARCH REPORT**International application No.  
PCT/FI 2005/000009**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.: 1-10 in part  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

see next sheet

3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

**INTERNATIONAL SEARCH REPORT**

International application No.  
PCT/FI 2005/000009

The present claims 1-10 relate to a scraper comprising an elongated, at least tension transmitting flexible structure, formed of formed pieces. However, the application provides support within the meaning of Article 6 PCT and disclosure within the meaning of Article 5 PCT, only for a scraper meant to be used for scraping of substance in a liquid basin e. g. to a surface or a bottom chute by means of a scraper bar arrangement moving in the liquid basin.

Consequently, the search performed has been targeted to cover the embodiments described in the application, but has also included scraper conveyors. The search has thus been focused on a scraper meant to be used for scraping of substance in a liquid basin e. g. to a surface or a bottom chute by means of a scraper bar arrangement moving in the liquid basin.

## INTERNATIONAL SEARCH REPORT

Information on patent family members

01/04/2005

International application No.

PCT/FI 2005/000009

US	1755680	A	16/09/1930	NONE		
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				DE	3943624 C	04/02/1993
				ZA	9000147 A	31/10/1990